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EFFECTS OF THE EARTHQUAKE WAVE AT KASUGAI, JAPAN, JUNE 18, 1950



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THE RECENT EARTHQUAKE WAVE ON THE COAST
OF JAPAN

By ELIZA RUHAMAH SCHMORR

On the evening of June 15, 1893, the northeast coast of Honshu, the main island of Japan, was struck by a great earthquake wave (*tsunami*), which was more destructive of life and property than any earthquake convulsion of this century in that empire. The whole coastline of the San-Riku, the three provinces of Rikuzen, Rikuchu, and Rikuoke, from the island of Kinkazan, $38^{\circ} 20'$ north, northward for 175 miles, was laid waste by a great wave moving from the east and south, that varied in recorded height from 10 to 50 feet. A few survivors, who saw it advancing in the darkness, report its height as 80 to 100 feet. With a difference of but thirty minutes in time between the southern and northern points, it struck the San-Riku coast and in a trice obliterated towns and villages, killed 25,975 people out of the original population, and grievously wounded the 5,390 survivors. It washed away and wrecked 9,313 houses, stranded some 300 larger craft—steamers, schooners, and junks—and crushed or carried away 10,000 fishing boats, destroying property to the value of six million yen. Thousands of acres of arable land were turned to wastes, projecting rocks offshore were broken, overturned, or moved hundreds of yards, shallows and bars were formed, and in some localities the entire shoreline was changed.

They were all seafaring communities along this coast strip and the fisheries were the chief industry. The shipment of sea products to the great ports was the main connection with the outer world. A high mountain range bars communication with

the trunk railway line of the island, and this picturesque, fiord-out coast is so remote and so isolated that only two foreigners had been seen in the region in ten years, with the exception of the French mission priest, Father Raspail, who lost his life in the flood. With telegraph offices, instruments, and operators carried away, word came slowly to Tokyo, and with 50 to 100 miles of mountain roads between the nearest railway station and the seacoast aid was long in reaching the wretched survivors. When adequate idea of the calamity reached the capital and the cities, men-of-war, soldiers, sappers, surgeons, and nurses were quickly dispatched, and public sympathy found expression in contributions through the different newspapers, amounting to more than 250,000 yen, for the relief of the injured. The Japanese journalist and photographer were quickly on their way, and the vernacular press soon fed the public full of horrors, yet the first to reach the scene of the disaster was an American missionary, the Rev. Rothsay Miller, who made the usual three days' trip over the mountains in less than a day and a half on his American bicycle.

There were old traditions of such earthquake waves on this coast, one of two centuries ago doing some damage, and a *tsunami* of forty years ago and a lesser one of 1892 flooding the streets of Kamakishi and driving people to upper floors and the roofs of their houses. The barometer gave no warning, no indication of any unusual conditions on June 15, and the occurrence of thirteen light earthquake shocks during the day excited no comment. Rain had fallen in the morning and afternoon, and with a temperature of 80° to 90° the damp atmosphere was very oppressive. The villagers on that remote coast adhered to the old calendar in observing their local fêtes and holidays, and on that fifth day of the fifth moon had been celebrating the Girls' Festival. Rain had driven them indoors with the darkness, and nearly all were in their houses at eight o'clock, when, with a rumbling as of heavy cannonading out at sea, a roar, and the crash and crackling of timbers, they were suddenly engulfed in the swirling waters. Only a few survivors on all that length of coast saw the advancing wave, one of them telling that the water first receded some 600 yards from ghastly white sands and then the Wave stood like a black wall 80 feet in height, with phosphorescent lights gleaming along its crest. Others, hearing a distant roar, saw a dark shadow seaward and ran to high ground, crying "*Tsunami! tsunami!*" Some who ran to the upper stories



SCENES ON THE COAST AT WAKAISHI, JAPAN. JUNE 10, 1936

If their houses for safety were drowned, crushed, or uprisen, the water had to go.

Shallow water and rotating islands broke the force of the wave in some places, and a long, narrow strip of fertile land about a mile was broken into two parts, and even six waves, that

ran one and two miles inland, left on the tops, backs, and in the midst of fields, mud, red or mixed up with the same of waves, the rest engulfed or swept seaward. Where the wave

Where the coast was low and faced the open ocean the wave

surfers, swept away by the waters, were cast ashore on the

open coast, the wave came and withdrew within five or six

hundred yards before engulfing. The best swimmers were helped to the first surf of water and nearly all the ladies recovered

rocks, struck by and crushed between them. The force of the wave could be seen groves of large pine trees to be uprooted, and the tall grain to be uprooted and carried to the cross-belted hills far away. Many people were lost through not being back to save their property or to save their valuables.

The land on which the earthquake occurred the earthquake a portion of the land, retired, retired, and the water was not continuing to burn on

swell and low to the beach to meet the sea. The village officer, watching the start of crushing the waves for crushing the sea, ran

Another village officer, living on the edge of a hill, heard the crash of the big screens used to look upon the burning waters

had been a few minutes before. Four women clung to one another,

only survivors of another village were right now who had been

playing the game of "go" in a Fushie temple. Eighteen laborers floated away and 17 on high ground were believed to be the only survivors of the village, and one hundred people were

shores of the bay. The aged and fifty people were found cast away on rocks and shores. From two larger villages on our bay only thirty young men survived, hardy, muscular young men, some as powerful swimmers, yet in all of places the survivors

were miraculously preserved. The wave then on the roll, a black person at the pillars took to bolts and let the 175 convicts free. Only two convicts attempted to escape, the others

keepers. The good Mr. Masuda had just returned Kamatah from his mid-day work of 50 miles over the mountains and entered his house, when his assistant called to him from the street. The priest came to the temple, but in an instant the water was upon him. He was seen later, swimming, but evidently was struck by an herb or weed, and lost sight of his body has not been recovered. Japanese naval war cruised for a week off Kamatah, recovering bodies daily. The Japanese system of

Shinto was able to state that out of a population of 6,520 at

and away, and 1,600 people were left or swept out and lost.

few out of 100 anything for themselves or others. With houses

further and deeper waters, salvation found them, and the priest

and surprised to find, the atmosphere had become poisonous. The north-coast people are opposed to cremation and resisted

ment of the danger of pestilence. Deaths daily were sent in quantity, and the work of recovery and burial was so pressing that some bodies were put to it after all available coffins had been



long exposure in water, lying without shelter and from the heavy fish oil, etc., and 2 bottles, in great demand while in the first half of winter. Besides the generous relief for the sufferers,

its available funds and sent stores of provisions, clothing, tools, etc., to the poor, homeless, ruined, bereaved, and starving people of the San-I-Iku coast.

The wave was plainly felt two hours later on the shores of the island of Yesso, 200 miles north of the center of disaster upon the San-I-Iku coast, the water coming up to the first horizontal high tide mark on the beach in Hakodate. Eight hours later there was a

more than 70 miles southward, the water rising three or four feet and retreating violently. Six hours later, on the shores of Kure, the most northern of the Japanese islands, distant 1,000 miles the waters receded violently and washed on shore in a wave some miles above the normal height.

The plainest inference has been that the great wave was the result of an eruption, or action of other disturbances in the bed of the sea, 50 or 600 miles off the San-I-Iku coast. The exact

of the wall or bed of the great "Tuscarora Deep," one of the greatest depressions of the ocean bed in the world, discovered in 1874 by the present Hon. Admiral Beane, U. S. N., while in command of the U. S. S. *Tuscarora*, engaged in deep-sea surveys.

The "Tuscarora Deep" is nearly five and one-half statute miles in depth, being exceeded, so far as known, only by the still more profound one discovered last year in the South Pacific by Commander Alcock, U. S. N., of the United States Navy.

That later scenes were taking place in this treacherous sea was again suggested at six o'clock on the morning of July 4, when the United States Pacific Mailway Company's steamship *Empress of Japan*, sailing directly over it in a smooth sea, was sunk as if a propeller had suddenly been lost or the ship had struck an obstruction. Every one was reassured by the persistent shock, but no visible explanation was furnished. The destructive wave and

whether should stimulate further research into the nature of this dangerous bottomless pit of the Pacific ocean, which owes its discovery to United States explorers by deep-sea soundings.

* See *Nat. Ocean. Mon.*, vol. xiv, p. 25.

THE RETURN OF DR NANSEN

THE NATIONAL GEOGRAPHIC MAGAZINE, regarding as the saddest item in the extensive geographic explorations of Dr F. Nansen, especially the Svalbard, and the seven previous in the *Fram*, Nansen entered the park in September, 1893, at 74° 58' north, 134° east to the northwest of the New Siberian islands. The craft was, at the same period, driven in as part of the long *Greenland*. The *Fram* barely escaped destruction by the action of the ice, but it reached by March, 1894, at 83° 54' north, 102° west. At this point Dr Nansen, with one companion, reached Axel Heiberg, by going on a sledge over the frozen sea, 86° 14' north and 115° east, a point 2° 31' farther north than was reached by Jackson and Bennett, in the Greely expedition. Some lucky landed reached and not return to the *Fram*, which was left in command of Captain Svalbard, but started for Spitzbergen, via Franz Josef land. He reached, August 6, 1894, at 81° 28' north, 63° east, reaching never before of the Franz Josef archipelago, and wintered at the bay. Svalbard, in return for a dress coat, he almost immediately met the Jackson-Harmer party wintering on Franz Josef land and was brought safely by train to Varso. Nansen's experiences were a great and a great one, and his safe return was a great and a great one.

farther, interrupted in the annals of Arctic exploration.

Svalbard's work with the *Fram* happily closed the fears that were entertained for the safety of the vessel in Nansen's return. It would seem in the absence of definite information, that the *Fram* drifted to the northward of Franz Josef land and Spitzbergen, and came into open water to the northwest of the latter

parties, and the archipelago discovered by the Greely expedition remains the most recently land known. The very deep water, 4185 fathoms, found by Svalbard in a short extension to the north and east of the great reef existing between Spitzbergen

to new land between the north of Franz Josef and Spitzbergen.

Thus by his less and energy, reviving those who had of that

Franklin and Thule of the North

AMERICA

By ROBERT T. ELLI.

Chief of the Geological Survey

"But it ever seems to me that every word in the Ives and the English exact v, but Anglo-American language is so sharp, every little idiosyncrasy has terms." English writers seem to have gathered up a great many of them, but they got much of them from Scotland within the past thirty or forty years. They are not a part of our legitimate inheritance from the mother country. In truth we have in our country some three or four words which are available for the expression of certain shades of topographical characteristics. Any thing that is not how we call a valley and anything that stands up as we call mountain, and we call a hill or a mountain, but it is a square or a triangle if you please, such is topographic terms which are geographically exact, precise and distinct. There is scarcely a feature of the land which repeats itself with any fair approximation that are not a part name and these terms are as plain as the well as common. They designate things objects as we

find we use them."—Major C. E. Dutton, "Mount Taylor and the Zuni Plateau," pp. 156-157 Sixth Annual Report U. S. Geological Survey, 1884-85.

As a, proper generic name should be provided for every

expressed by the designation. The English language is

different specific forms.

diverted. Each of these has variations primitive of a large number of specific forms, passing from the most

* Prepared for a report to the Director of the U. S. Geological Survey on the geography of the Zuni Reservation and vicinity of the United States.

The English pioneers give to the topographic features of the country the following names: *lomas*, hills, knobs, chains, ranges, *loma montana*, and *loma montana*. They call all valleys like valleys, basin valleys, a very significant term, *arroyo*, river, *cañon*. I can not at present recall any eschewed language words for varieties of plateaus. I think we use *llanuras*—*plateras*, *submontana*, etc.—are no foreign terms. For *canchales* we use slopes, bluff, terrace, escarpment,

due to the fact that in England, where the English language developed, plateaus are not conspicuous topographic features.

In the portions of America situated or explored by the Spaniards, the topographic terms, as can be ascertained by any good printed map, are not the same upon any of the maps of the western United States. Although unfamiliar to eastern ears, these words are as emphatic as some of those invented by modern geographers. They also bear the stamp of priority, for they were probably applied to the features they now adorn before the English settled in the North American continent, and may have acquired a constant use by the people of the region. They appear on all published maps, and nearly every word used in this paper is taken from some printed map of New Mexico, of the adjacent United States of Mexico, or of the whole Texas.

It should, perhaps, be stated that the present article is not written from the standpoint of a philologist, and may not meet near the close criticism of a linguist. It is an attempt of the writer to look up the meanings of names encountered in his travels in Spanish America. Finally, on taking stock of the words collected, he has found that they cover nearly every possible topographic form in the region. These terms, as applied in America, differ exactly in no way in meaning with Castilian usage, but they are now Americanized and in daily use. They are now accepted by the criticism of intelligent geographers. Many of them may seem unnecessary and even useless, but there are some which the writer will survive and that in their original form must be adopted in any scheme of geographical nomenclature which would seek to have an appropriate general term for every possible topographic form.

NAME APPLIED TO BOTH GENUS AND SPECIES

The following list of geographical names of adjacent regions,

mesas and tableaus mesas. A bolson is a basin which is cut out of the surface of a drainage valley which has been cut through a bolson. Example, the El Paso mesa. Stream courses, ridges, etc., not tableaus mesas are self-explanatory terms.

A *cuesta* is a structural plan, so called that it has a perfectly sloping surface. The mesa is, in a manner, a transitional feature between mesa and mountain. The *Cuesta del Llarro* of La Marfa, Texas, about of the United States Geological Survey is an example.

Badlands—The hard face of plan is the *badland*. Badlands are barren valleys which have not, or at any rate not any flowing drainage, and are full with extraordinary canyons derived from the surrounding country.

A *patina* may be defined as a smooth floor of an extensive width that varies between the edges of mesas. In conception it resembles a plain in being limited by cliffs, but differs from a plain in the element of unevenness the floor of a plain being an even, level, or nearly level plain. Example, *El Paso Largo*, the flat surface of a southern tributary of the Canadian, in New Mexico near the Texas line. The surface of the Texas and United States rivers in eastern New Mexico are places of great importance.

Mesas and *cuestas* are structural plains, representing surfaces resulting from the survival of hard layers of rock.

The *gully* is a degrading land plan, lying between steep escarpments, and formed by the cutting away of the hard, rock floor of the mesa thereby the underlying more recent dated beds, to a deep stream bed beneath it.

The *valley* is an aggradational plan, formed by the filling of a natural country.

The edges of the rock escarpments point generally in some directions upland, down to a high structure. The mountain structure of rock escarpments back is not a to mesa structure.

The *cuesta* is a transitional feature and connecting step, between a mountain, mesa, and bolson. When a *cuesta* shows toward a mountain and has to a drainage or escarpment on the side facing the bolson and subparallel to the mountain range, the valley

* The *cuesta* is a large point. Example, *Plano de Mampito*. Lake *Barro Colorado*.

called as "basin ranges." The escarpment of a *cuesta* is often also developed in the trough thus formed at its foot. This process, many times repeated, produces alternations of broken plains and of basin ranges of the *cuesta* type.

There are always large valleys between the mountains, mesas or cañons, and are of subsequent origin.

There are remnants of plains, once more extensive, but now reduced to mesas, representing areas from which the mesas have been removed, and, conversely to the mesa, are increasing in extent.

mountain area of the Rocky mountain or alluvial.

along the Perote and Canadian valleys of New Mexico but are not very developed in the plateau countries where the formation known as the Red Beds enters into the substructure.

the escarpment for it and usually increase as move westward.

The altitudes of plateau countries of the Southwest are from 2,000 to

near level

WORDS APPLIED TO PLACES

4. 10 terms applied to descriptions are

Cerro	Puerto,	Peak or summit,
Cerro,	Pajada,	Balance.

Cerro—The name assigned to the Pike within the first description of which I and mention of the great escarpment exist but at the same time, recall of that portion of the mesa (plateau) of the same known as the Llano Estacado. I have been unable to find any work on the subject within

reflexo is it in describing the break or consequent great bend over as follows: "The Mexicans who started with Alost Pike in his journey across the prairie spoke of this slope and gave the name of *Lan Fayas*, or the Eye-crowns, to this singular range [?]. He [?] appears to have passed to the south of the slope [?]."

The word *eyes*—originally meaning a fringe, selvage, or border, and in topography is used for the escarpment ridge of a mesa. I was somewhat surprised to find this word used in its literal sense as to escarpment, or mesa. I have already mentioned some use of the United States Land Office in the west of New Mexico—the *Cuando los Cominos* mesa, the *Cochise* desert mesa, the *Sierra Blanca*. If there is any feature—seen or supposed—there where in the arid region of New Mexico it is these eyes, elevated horridly and on the surface the same as far as the eye can see.

Espejo is the diminutive of *eye*, and is a very appropriate word for lines of low escarpments which are frequently met with. These are usually a secondary rise, quite out of the latter eye. For instance, where a mesa has a complete escarpment the appearance of it constitutes the proper use of *eyes*, while on lower slopes several smaller but less prominent. The arrangement, the faces of which may appropriately be called *espejos*.

Horca.—In the account of the Texas Santa Fe Expedition is found a description of how the party was placed for a camp along the mesa edge trying to find a place where they could descend the edge of the northern slope of the Idaho plateau. Such a place, due to the flat riding of the profile of the mesa forming a broadwater drainage, was called a *horca*, which may be defined as drainage notch through a mesa or mesa.

Horca.—The term *haya* is a literary name a gradual descent. I find it used upon the map of New Mexico and applied to a gradually descending slope as distinguished from a more vertical escarpment. For the *haya* is but a small term. I take the liberty of proposing to write

might be. The use of the latter kind are composed of talus and often consist of no extension for more such as that a new west of the Rio Grande in the Santa Clara, New Mexico, since of the United States Geological Survey. This definition is made in order to distinguish between a *haya* and a *mesa*, the latter being a table structural form.

Horca or *horca*.—Literary the place where and when was effected. The *horca* word is a account of the Santa Fe Expedition, and he describes how the party became lost and entangled in the escarpment rising eastward of the edge of the Idaho plateau. These were the high country the *horca* created eyes on the know as Bad Lands. The base of nearly all the *horca* grade into extensive regions of sand dunes.

Horca (volcano).—This name has been specifically applied and is

* Narrative of the Texas Santa Fe Expedition, by George William Kendall. Vol. I, page 241. London, 1844.

‡ These should be a term for each of these kinds of slope.

§ Journal of the U. S. Geological and Geographical, 1844.

Issue between a *cañon* and the Rio Grande.

NAME: *ARREAL* TO STREAMS AND STREAM VALLEY

Arreal is exceedingly rich in apt separate names for both streams and stream valleys.

A few of the words applied to the stream proper

Arroyo.—A flowing river, the arterial trunk of a drainage system.

Cañal.—A creek or tributary to a lateral of the main *arroyo*.

Cañal (meaning *cañal*).—This is a useful word for a constantly used outlet headwater run (either of a *cañal* or lateral). It is everywhere with the term "draw," used in the arid or Plains region of the United States, the "wash" of Mexico, and "draw" as used in the South.

Arroyo.—A streamway, ordinarily dry, in which water occurs only after a rain or after a freshet or flood.

There are also many terms describing certain characteristics

of the *agua*, *arroyo*, *cañal*, *arroyo*, *arroyo*, *arroyo*, etc.

The Spanish language likewise presents a rich resort to it of appropriate terms descriptive of the form of the stream valley or drainage basin.

Arroyo.—A gorge of the first magnitude in a mountain region. The

word is used in the lower portion of the hierarchy.

Arroyo.—A special term for a streamway having very steep walls and a narrow gorge. It also conveys two ideas, verticality of wall and narrowness of the valley.

Arroyo.—A stream having vertical walls like the *arroyo* of a *cañal*.

Arroyo.—A *cañal* in which the walls have the profile of a *cañal*.

Arroyo.—A *cañal* in which the walls are *cañal*.

Arroyo.—The *cañal* of a *cañal*.

Arroyo.—The place where the water of a *cañal* begins to flow under the head of drainage valleys. It resembles the *cañal* in that it is formed by the vertical walls but differs in that the *cañal* instead of being narrow is of great breadth.

Arroyo.—Lateral *cañal*, a sort, wide arm of a *cañal* or *arroyo*, receiving drainage at its inner end, as I suppose it is a *cañal*.

Arroyo.—This word and *arroyo* means a *cañal*, and is extensively used in the *cañal* and *arroyo* regions, American states.

Arroyo.—Where a *cañal* way suddenly becomes a *cañal*, *arroyo*, *cañal*, or other precipitous gorge, and the *cañal* on a *cañal*, the *cañal* is

called *cañal*.

Arroyo.—A streamway without conspicuous banks or by the

Arroyo.—A deep and narrow pass through a *cañal*.

Arroyo.—A narrow pass through a *cañal*.

The foregoing words cover nearly all the characteristic types we have no good English equivalents.

There remain, however, which I have as yet found no appropriate Spanish word. One of these is the elongated lowwater meandering of a streamway bottom.

This type of waterway is especially developed along the eastward side of the Great Plains south of the

Rocky Mts., where the heads of all the principal drainage

streamways have often been partially filled by later neotectonic material. The form of valley is to a certain extent a elongated stream. It may also be considered as a narrow plain.

One of the characters where the Red river adopted the U-shaped valley. For the want of a better name, the term *quadrado* could be provisionally used for this type of valley.

Nearly all the stream valleys described above are the result of normal drainage following the inclination of a sloping plain

of a stream is opposed by a high, not-being escarpment which is, at the present. We should here stop going to describe the method by which this has been accomplished it may be stated that these are usually great V-shaped valleys indenting the escarpment at

forming from it in that the apex of the V points down stream instead of up stream the waters and so that it follows the drainage at its wider end instead of following it to the top. A thorough Spanish linguist has failed to find the name, the cowboys have called it the "dry-pan valley." The form of topography is a conspicuous feature of the Texas region.

In conclusion, let us illustrate the appropriate use of these terms by direct application to the Rocky Mountain and Great Plains region. This as a whole is composed of great masses of mountains, some ranges, and single ranges and masses.

* One of our little illustrated book store Quichada was a combination of Quichada, but Mr. James Mackay informs me this name is not the name. Quichada being a combination word signify-ing water.

southern, the Lakeland corridor, the Canadian corridor, and the corridor of the eastern Sierra Madre. Each of these gates westward into a great mass of plateau region. The

Interns lie west, south-west, and south-east of the main con-
-spire. The main ridge over them is protected on the west by a

mm. The eastern Sierra Madre of Mexico likewise flattens out westward into an extensive plateau region, which, for the want of a better name, I call the *Parrus* plateau. The plateau is becoming

source of the host range type, separated by basins. East of the plateau region is the lowland on the west and north by

of Pointe à la Croix, and on the southeast by the Canadian
in settlement.

There are also internal areas of men-like & pup-like y-bos

Florida connects and the northern end of the Guadalupe mountains. The great cordillera in western Mexico known as the Sierra Madre passes at its northern end into the Cordillera

in southern California and Utah near Nevada.

14. The conspicuous palm trees are the trademark and

regions. On the east are the numerous prairies of Texas, which we have described as dip plains; these are interrupted, however, by the Central Denudation, lying between the somewhat-ascending ranges of these prairies* on the east, and the eastward-looking slopes of the plains on the west. A collectively a great plain country.

• Երեսնական տարեկանից հետո համարյա խնայողությամբ ախտահարվում են միայն 10-15% անհատներ։

The escarpments bordering the mesas and surrounding the

into, the escarpments are nearly everywhere composed, consisting of a summit of granite, leading down by slopes of basalt and scoria to a lower pediment, usually made of even rounded boulders.

Let us also see how these terms will apply to the description of what we commonly know as drainage basins.

East of the mountain the two through-flowing streams of into mesa regions and thence to plains. The streams of several neighboring, such as the Rio, Brazos, and Colorado, arise into a mesa and pass through cañons or gulches into plains. The

city-panes. The fry-pan of the Texas is the southern end of the Texas pan where this stream, near the thirty-first parallel, enters a cañon made by the glowering walls of the Stockton

is also a fry-pan valley. The Brazos, Colorado, Trinity, and turn edge of the Grand Prairie escarpment.

The Canadian may be thus described: The cañons leading down from the foothills of the snowy range in the mountain

is a cañon. The lower of this cañon is where the stream enters

area. From the base to the Rio mountain the stream runs then is the plain country of the Canadian, away toward the foot of the great range of the Llanos Estancia on the north and of the Las Vegas mesa on the north. The plain of the Canadian as a whole is subdivided by scoria into numerous successive plains. The stream leaves the plain country through

Plains through a cañonetta. This cañonetta again has a lower part the black moribla, marking the entrance of the river into the still greater plain of the Llanos, the Rio region. Here the

er and embankments or bed loads.

The Colorado, like the Arkansas, has its outlet in the Rocky Mountains. Its outlet is quite different. It soon enters the great basin of San Juan valley and continues in a long, undulating tract of high, as the entire distance in this New Mexico and into Texas is as far as the time in an hour. There, when the turbidities are released, it flows through great barrenness. Leaving the mountainous course through the Santa Fe, it ends in a low, sandy, and

not

THE WEATHER BUREAU FILES AND FLOOD SYSTEM

By Professor Willis L. Moore

Chief of the Weather Bureau

The special work of the Weather Bureau in connection with the rivers of the country is to furnish our citizens on an agreeable stream as with the best possible information as to water stages along the course of each river, and to issue timely warnings of floods with a view to the saving of life and property.

On January 1, 1906 the Weather Bureau river and flood system consisted of 143 special river stations, equipped with instruments for measuring the vertical rise of the surface of the water, and in many cases with standard thermometers for measuring air temperature. These stations were manned by local observers, receiving from the Weather Bureau, by mail, a schedule with their services. There were 42 mobile stations equipped with camp stoves and furnished by local paid observers, and so distributed to the various river basins of the United States in important rivers as to give, in connection with the regular meteorological Weather Bureau stations, a fair approximation to the average rainfall throughout each watershed. There were 18 canals or gauged and regulated stations of the Weather Bureau where river measurements were made, and 10 Weather Bureau stations which were centers from which flood warnings and forecasts of expected changes in river level were issued.

As yet hundreds of dams for flood control are large in part. The work of the river center is familiar with the Colorado river

station is another, and the history of post race. The knowl-

exist, is perhaps of as great importance as the knowledge of high water. If high, trustworthy estimates are received at the confluence

ly upon Bond's report. "As a field in charge of a river center, I expected with the dam at his command, to give information to those interested in navigation, even during low or medium stages of water, but as of great pecuniary value, it was my foremost duty in the lower course of workings with the dam, report it.

Stages 6 to 11 related to river stages have been published by

T. S. Signal Bureau. From the data thus collected and now covering forty years at some stations and shorter periods at others, the following general relations have been deduced. The time it takes high water to pass from Littleport to Wheeling one day, from Parkersburg to Parkersburg, two days, from Parkersburg to Cincinnati, three days, from Cincinnati to Cairo, six days, from Cairo to New Orleans, seven days, and from New Orleans to New Orleans, eight days. From Littleport to Cairo, ten to ten and a half days, and from Cincinnati to New Orleans, ten to ten and a half days. So charged and so at once concerning the volume of water rivers have been determined. Since the time of travel is so great it naturally follows that many interfering conditions arise to delay the movement or retard the crest of the flood wave. No important ones are shown to present in the volume of water passing a station in a given time is known for only a few places, and varies, of course, with high and low water, nor can simple rules be based upon the results, and the volume of water at the end of the run is not so simple and direct as at the beginning. The frequency over the drainage area is not always distributed

The principal rivers concerned in the Weather Bureau sys-

and local value of the central value. The volume, direction, and seasonality of the Pacific coast and the Hudson, Susquehanna, Potomac, Savannah, Chesapeake Bay and Alabama of the Atlantic and Gulf coasts. Gauging stations are most numerous on the rivers of the central valley, and east of the mountains are more numerous throughout the entire mountain basin of these rivers until they are on the coastal rivers of the Atlantic and Pacific coasts.

The provisional system of the bureau was reorganization on June 8, 1902, and the duty of warning communities resident in the

center has a definite section of the river system of his district to watch and forecast for. He receives the necessary telegram

whether the source of the main river than his own station, and also gauge readings on many of the tributary streams. Each forecaster is furnished with the area of the catchment basin from

which a rising may cause a rise, while a rapidly falling run of the same amount on an impermeable and greatly forested surface

causes a rushing torrent in the main stream. Local forecasters

as possible for the work before them. In view of the fact that of the ability and experience of the men employed on this important duty it is believed that flood systems now can be met in the future without adequate warning of the same by the bureau given to all concerned.

The territory assigned to each forecast district is as follows: New England, Mississippi river from Vicksburg to its mouth and the Red and Canebrake rivers, Arkansas; the river from Memphis to Vicksburg, Cairo; and section of the Ohio from Evansville to Cincinnati of the Mississippi from St. Louis to Memphis; St. Louis to Mississippi from New Orleans to St. Louis and the Missouri east of Kansas City; Chicago; the Missouri from Kansas City northward; Cincinnati; the Ohio and

tributaries from Evansville to Marietta, Nashville, the Cum-

mers in Alabama; the back the Arkansas; St. Paul the Missouri; the lower Liverpool; Harrisburg the Susquehanna, Newport the Savannah; Portland, Oregon; the Snake and Columbia, San Francisco the Sacramento and San Joaquin.

A river cross-section has been placed on some of the principal steam boats so that the river is arranged that the river is always open to the people on shore and on passing steamers. This photo arrangement for measuring the river for the lowest reference and to know height of the water at the places to which they are found.

A river gauge is a graduated scale on which the height of the river is measured. The zero of the gauge is usually set at or somewhere near the level of the lowest water known. A gauge

is of such length to cover the greatest height of water likely to occur. When a river gauge is set up on a vertical, it is set in the bank according to the slope of the ground. The foot marks on a gauge of this kind must be accurately located by means of a spirit-level so as to agree with those on a vertical gauge. When a stage of water below the zero occurs, it is read as a minus stage. It is not desirable to change the zero point after readings made from that basis have continued for any length of time.

It may be of interest to know that on most of the narrow-

water boats the river must rise a few inches from 30 to 35 feet before the danger zone is reached. At Cincinnati the danger level is 45 feet above the zero of the scale, and at a height of 71 feet a levee must be used to protect it. On the upper Mississippi the danger line averages about 15 feet above zero but from St. Louis and on west to Vicksburg it averages about 30 feet, and at New Orleans, with its great system of levees, the danger level is but 13 feet above zero.

In the early history of the river system the data received from the various river stations, though meager, were sufficient to permit useful warning of marked changes in the river level. In the spring of 1874 the reach of the Bureau had its first experience with restricted floods. In that year floods occurred

and other rivers, causing damages to the levees and the surrounding

large areas of bottom lands in the Mississippi delta. The value

Wentworth Bureau for Signal Service U. S. A., as it then was, could

to the people of the bordering countries, and showed daily the average rise or fall of the water. A study of these figures showed that

water above which the stages were dangerous to river interests. These points were designated as "danger levels" and "danger lines" and were established for the Mississippi, Missouri, and Illinois rivers during that year. In prosecuting this work, data from the best available authorities were collected and compiled for the construction of a map of the basins and watersheds of the principal rivers. A river stage was designated, on which were indicated the average grades of the beds of the various rivers at different parts of their courses. The object in preparing this

map was to show the relation of the rivers to the land. When an unusually heavy rain was noted in any watershed, it was known what rivers it must flow into and approximately how much water would result. A

course, but also to give timely warning of the approach.

Some idea of the vast destruction of property by these May

1881 and of 1882 caused a loss of not less than \$5,000,000 to the

also be noted that the flood of the spring of 1882 caused a loss of 125 lives in the region from the Gulf of Mexico to New Orleans.

In forecasting stages of water during the flood periods as before two years ago, it must be borne in mind that precipitation on any is only an inaccurate factor. In these cases vast quantities of snow which had accumulated during the winter over the northern states, and with the early rains of spring came under the heat, causing a very rapid melting of the snow lying over many of the watersheds. In these floods it is probable that the season's course of abnormally high temperatures was a more potent influence than the snow in precipitation.

The flood of 1884 began in the Ohio valley in February, when the river reached its highest stage on record. The Mississippi river from Cairo to the Gulf also reached a very high stage,

points (throughout the Ohio valley, and the resources of the Bureau were taxed to the utmost in the interests of the flood control. The damage caused in the Ohio valley by this flood we all have to be calculated. In the region above Cincinnati alone the loss of property was variously estimated at from \$10,000,000 to \$25,000,000.

From June, 1889, to June, 1890, the enormous expense of

the way of establishing main stations near the headquarters of

part of June, 1890, forecasts were made twelve to twenty-four hours in advance of the flood, which reached the city of Washington, and the value of property saved in this city alone was

the service of the country. In the spring of 1890 the lower

and Louisiana. Special flood warnings, which were actually confirmed by the subsequent stages of water, were issued from

far in advance of the flood-crest. No one is able to say what would be the result to the vast city, from a commercial standpoint,

unperceived, and are, therefore, subject to more or less error. The advantage from the rainfall at the point of the support of the river and flood system of the Weather Bureau is not greater than the value of property that may be saved in the case of an ordinary commercial house.

In considering the results of the Weather Bureau to the

office. In the heavy mountain region there are about 1000 people, but, on account of the poverty of the population, there are not many important things to be learned, except data are not being received. Many of the people of the mountain region are not well educated, and of great value in the collection of the proper information of the important work.

CHARLES FRANCIS HALL AND JONES SOLOMON

The second paying letter—one of the two written by Hall, the well-known Arctic explorer—is of unbroken interest, both personal and historic, and its nature is, in view of the great effects of Mr Robert Stoen as at present Arctic explorer, and his safe voyage set on on the shores of Jones Sound as particularly timely. The letter, addressed to Sir Henry Foxworth, then of Harvard College, descriptive was, in connection with the position of astronomer to Hall's expedition, which Mr Foxworth declined. It will be remembered that Hall's instructions of June 10, 1871, authorized its open to his own choice. Admiral Davis, in his official narrative of the expedition, says that Hall wrote Foxworth on December 1, 1871, that his plans would be on Jones Sound, but that, "He feared or seemed to change this opinion before leaving the United States." As no possible information as to the other route could have reached Hall, there cannot have been hesitations and undue discussion on the part of Hall.

This letter, dated just one month before he left Washington, shows Lind setting forth in detail his plans for exploration on Jones sound, and confirms the belief, held by most Arctic men in this country, that his previous visit to the sound was due to his

1954 11 10 10 50 AM

It may be a fact that the resources made up of a vast amount of timber & land by Nares' expedition in 1870 and later years 1882-83 prove that no excess of timber could possibly have accumulated in the mountain would have wanted that period of time.

At 11, or 12, I was told of attempting to ~~take~~ ^{take} down one of the poles ~~to~~ ^{to} get a log used to make Δ , W. C.

16 548787104, D. C. 464 20 1.57)

The museum occupies a large area of land, and contains not only two museums, the Ford Museum, which is largely devoted to the life of the president, but also a zoo. The zoological museum is a splendid, historic one, and is well known throughout the world for its fine collection of birds, by the Ford Museum of Ornithology, and its fine collection of mammals, by the Ford Museum of Mammalogy.

The grand design of the new museum, the W. C. Clegg and Sons, at the end of 1900, is to make a design of the old building from a street of the "50" with a lot of

North Pole. To do this I feel [worn?] to contribute all I can in advancing the cause of science, especially of that branch relating to arctic study. For most fair men the new [un]biased designs for the North Polar

Arctic service that any country ever fitted out. The vessel is to be in sailing about the 1st of June at which time I hope to take departure. Capt. S. V. Poole, Jr. of Green, Conn., is the sailing master and second. Hobbs C. Chester of New York, Conn., is the first mate. The former has been at sea as a 20 years navigating more or less, a sailing master, the latter one year for 12 years in the Arctic sea. The second mate is William Morten who was on the first Green when it sailed in 1870 and will be here on his remarkable expedition of 1882-83 and '84. The vessel is the old cutter who, with her berthmaster, Long, made the arduous journey northward from Kane's winter quarters, latitude 72° 34' north, to the edge of the constitution, where he discovered the renowned Open Polar sea.

will accompany me back to the north. This family I brought to the States in the fall of 1881, when I returned from a five-year voyage and travels in the Arctic regions. The whole expedition from the States will consist of about 27 men. The vessel is about 40 tons—a topsail schooner with a very powerful 10-horsepower engine and one of her masts as a transient for one of the higher settlements of Greenland. By having this transport to carry provisions and stores, a great condition can be represented in the progress of the expedition. My journey made is along the west coast of Greenland at the above line of 70° north and I turn to the westward, striking upon Jones Sound. After a passage of 100 miles of water for about 150 miles, however, begins, when the power of the vessel is made of the vessel is, if land and water is permitted, to be used on to the north as far as practicable. It is quite probable that the vessel cannot safely be advanced further than latitude 72°, which will make a distance, of course, of 100 miles to the Pole. The time of arriving at latitude 72° will be about September 1; then a winter has begun and the month for and season passed is it. The following spring of 1882 arctic parties will be organized and set out on land. By studying all the besting—just as nature's highway shall be found to be—the natural advantage of the earth's water must be fully reached by the advancement of this party; then my mission will have been performed and at all times, I expect to succeed in accomplishing the purposes of this [?] Arctic Polar Expedition within two or three or four years, yet I may take five years. However, I am sure in this expedition must understand that if the vessel is not well understood that I will be fully satisfied that the expedition and to add that perhaps to it to the end of time from two and a half to five years. I am confident however, that the purpose of the expedition will be accomplished by the end of one and a half years from the 1st of June next.

You are undoubtedly acquainted with the work that bearing the name of Mr. Kane's expedition in performance. . . . way to the last

that Congress had not appropriated but half the money now I demand for the expenditure, the salaries of all are far less than they should be. It is certain that if the objects of this expedition should be fully accomplished every one of them that should have been energetic, faithful and true will on the return of this expedition be ~~promoted~~ *rewarded* by our Government and our Congress has made no such arrangement as C. R. Smith and his representatives. *I have been thus deceived by some of these Senators and Representatives.*

Yours,

C. F. Adams

Commanding U. S. North Polar Expedition.

MINERAL PRODUCTION OF THE UNITED STATES

The United States Geological Survey has issued a bulletin of August 1 a statement of the mineral production of the United

States for the year 1891. The figures are given in the July number of the NATIONAL GEOGRAPHIC MAGAZINE, the corrections being now necessary by the issuance by the Director of the Mint of revised figures of the production of the precious metals. The production of silver is now given as 62,757,480 ounces instead of 47,000,000 ounces, as in the former statement, a corresponding increase of about two and one-half per cent on ounces giving place to an actual increase of over

one-third of \$47,000,000. The total production of minerals is valued at \$122,220,723 instead of \$11,735,291, as previously stated, the amount now found to have been produced during 1891 being nearly one-fifth greater than in the two preceding years and exceeded in value only in 1890 and 1892.

MAY AND JUNE, 1896

A resident of Hakodate whose business connections are largely with the sea-going commerce that comes from Kaituma's bay, on each spring to land along the Japanese coast, has given me, inform-

ing me a somewhat vague expression of opinion on Tuesday morning, and I saw that unusual conditions existed there

just before the great wave of June 15, 1895, devastated the Japanese coast.

The poles off the southeastern coast of the Kurile Islands, the volcanic range of volcanic or half-submerged peaks whose summits

had been reached by Admiral Bellin, of the U. S. S. Thetis.

As their small boats were separated from the schooners, the

coroners, and if the pelagic sealers were not the most practical

sealer with a boat and its small boats out, set 72 miles to the southwest, clear day. The following day it set 60 miles to the southeast, and the third day it set 40 miles to the southeast, and it was home 40 miles to the north.

As it was however, set 12 miles to the small boats to a head of sea, a

long set of small boats was carried to the southeast. The masters of all vessels were put out by three current, and then a rock of

the temperature of the water is carefully watched by pelagic sealers, as the variation of a few degrees either way will pre-

vent sealers from the water of unusually high temperature.

19° to 21° Fahrenheit in the course of a few miles, and the

the second week of June. The big sealed sealers, the

involutions at the close of their hunting season, was all about the inshore currents, the ships running like a wall and the

planned Tasarora day.

As all these sailing schooners were of Victoria, British Co-

asts and inspect the log books of the masters of these vessels. The exact position of the float up parties encountered by the *Arcturion* (or should at least be an interesting story for future deep-sea surveyers to know.

A very interesting geographical statement has been received from Miss Giddings, sister of our author, who passed through the region. She writes, as follows: "The information that the glacier which was found down to within 20 miles of the shore of the Gulf of Alaska, was the source of the Humboldt current. This water is so fresh that the fisherman catch, and was then lost to the Gulf of Alaska.".

GEOGRAPHIC NOTES

ALASKA. Mining experts say that the Kootenai district of British Columbia is probably to be the great coal and iron-producing region of the world. In 1900, in the Kootenai the principal mining camp of the district, has increased during the last year from 300 to 5,000.

AMERICAN. The recent parliamentary elections in Canada and the change of administration they have involved are so general for our part of the continent of North America into the Dominion of New York.

SOUTH AMERICA

ARGENTINA. The total number of immigrants to Argentina in the first six months of 1900 the number landed was 27, 800, of whom 24,320 were Italians, 1,000 Spaniards, 1,100 French, 407 Austrians, and 1,000 Germans.

EUROPE

ENGLAND. Several strikes of striking men were experienced at London and London in 1900.

INDIA. A new way to manufacturing with a export to reach the present trade of Amherst and the White Sea.

UNITED STATES. The results of the Manufacturing and export of goods and a large increase on those of last year.

A movement has been inaugurated for celebration at Boston, on Jan. 1, 1907, to celebrate the centenary of the discovery of North America by John and Sebastian Cabot, who sailed from Boston.

FRANCE.—A steamer bound to Luzon, the export vessel was unveiled at Cherbourg on August 13.

The population of France, according to the recent census, has been officially declared to be 38,225,000, an increase of only 131,000 in two years. The population is, in fact, practically stationary, there being but one birth in each year to 1,000 inhabitants.

RUSSIA.—In the hope of increasing the traffic to reach the Baltic sea, it has been decided to reduce the tolls, the change to come into effect Sept. 1, 1907.

Five first-class ironclads, with a displacement of 24,000 tons each, and 12,000-horse power each, are of war, and belonging to the German navy, recently passed safely through the Suez canal.

The foreign trade of the German empire is steadily increasing. The total imports during the last year ending June 30, 1906, were \$1,529,000,000, and the total exports \$1,657,500,000, as compared with \$1,400,000,000

AFRICA

SIERRA LEONE.—The Russian government has finally decided to make Vindhia a very important port.

SIERRA LEONE.—The Sierra Leone Railway system, with about 1,000 miles of line in operation, has been sold to a syndicate for £6,000,000.

CHINA.—The four sections of the commercial mission sent to China, set out on Nov. 1, 1906, and returned to Shanghai on Nov. 10, 1906.

The coast at Lun-chau, in the northwest of the Chinese province of Kiangsu, was visited by an earthquake wave on July 25. Several villages were destroyed, and it is estimated that 4,000 of the inhabitants perished.

TURKEMAN.—The Swedish traveler, M. Sven Hedin, reports the discovery of a whole group of heretofore unknown lakes, to the east of the Yarkand Tataria, at 40° north latitude. Between the Khotan Daria and the Khotan Daria he discovered two ancient lakes, and found the first of the lakes to be a large lake of wild camels. M. Hedin discovered the Khotan Daria as far as the place where it loses itself in the sands.

AFRICA

The first mile of the Uganda railway has been laid at Kampala with important consequences.

Work will begin immediately upon the construction of the third section of the railway, from Kampala to the lake of Tanganyika, and the great road.

A journey in many respects remarkable, but no more more than a few miles, has just been completed by M. Comte, Baron de Bismarck.

and M. Spork, who left Zanzibar on July 6, 1905, crossed the Nile on January 19 following, and arrived on the west coast by the first week in August, having crossed the continent by the brief space of 13 months.

ROADS AND RAILWAYS. The Congo State railway has now reached Tshumbe, 287 kilometers from the starting point.

MINES. No clear roads, canals, navigable rivers, nor any wave exist as to mines, nor are they thought of. No coal country exists, the only prospect of coal is in the north.

DRAGON PEARL STONE. In Zanzibar, the well-known explorer, now of Vienna, has received advices of the discovery of great quantities of dragon pearls in the interior.

MANICHAISM. While there is no longer any open resistance to French rule, Manichæism is in a nominal form of assembly from one end to the other, and only the towns occupied by troops are safe for Europeans.

SLAVERY. A recent report of the British consul at Zanzibar has a tendency to induce the Government to discontinue the imports from Zanzibar. It is stated that the slave trade is reported to have been stopped by the United States, being much less profitable than Manchester produces one of the same price.

INDUSTRIES. The first census of a number of populations was taken in 1894, and the results of the censuses given a total of 1,200,000, of which 600,000 were in the north, 400,000 in the south, and 200,000 in the east. The total population was 1,200,000.

RAILWAYS. An electric street railway has been opened in Zanzibar.

The number of miles of rail built and all with by the Egyptian Government in 1905 was 2,400 miles, and the total was 10,000 miles.

The natural overflow of the Nile is two months late and great anxiety is expressed with regard to the crops and the crops.

At Kordofan, where a contingent of the Anglo-Egyptian army is fighting the rebels of the Sudan, the British Government is sending the rebels into the interior, the territory now being under the control of the British.

MINING. In a recent lecture on "Mining in East and West" by the Minister of Mines, the governor of the province stated that the British Government is now in the process of opening up the mines of the province.

The British Government is now in the process of opening up the mines of the province, and it is probable that the British Government will be able to secure the same results as the British Government has secured in the past.

The British Government is now in the process of opening up the mines of the province, and it is probable that the British Government will be able to secure the same results as the British Government has secured in the past.

MINING. It is proposed by the British Government that a great number of mines be opened up in the province of Zanzibar, and it is probable that the British Government will be able to secure the same results as the British Government has secured in the past.

INDUSTRIES. The yield of gold in the Zanzibar province amounted to 1,000 ounces, the highest amount of 10,000 ounces as compared with the previous year of 1904.

Western Association. The colonial government is providing irrigation and organizing a water supply for the gold fields, the extension of the railway system and the improvement of docks and harbors. The present estimates a gold production of £7,000,000 per annum.

THE AMERICAN ASSOCIATION AT BUFFALO

The forty-fifth meeting of the American Association for the Advancement of Science was held at Buffalo, August 22-27. The attendance was rather small, partly on account of a hot and informal, only Eastern institutions being registered, yet in the number of investigations and teachers of science the meeting ranked well, and in general satisfaction of the programme, considering it was above its average, so that, despite

most of the material of interest to geographers were presented in Section E. One of these was an elaborate paper on the "Development of the Physiography of California," by J. J. Smith, in which the writer

Trink presented "A history of the Mountains of Minnesota," in which the significant topographic features were interpreted and J. C. White described and discussed the "Origin of the High Terrace Terraces of the Mississippi River." Of value to geographers, too, were Carey's paper on "The Glaciation of Minnesota Caves" and "The Glacial Caves." It is that the "Glacial Period" is a term defined by the writer and other general correlation of the stream, produced under conditions of the glacial and non-glacial to cover the period over a wide belt instead of forming a single convergence and expansion. The remarkable geographic features of the western United States and northwestern Mexico—rugged mountains rising sharply from smoothly graded and lightly-wooded basins—have been produced of successive erosion, the latter, by restricting our local for and distant as well as certain large and small streams.

of topographic features in North Carolina, also to cover the various and different Southern New England and the New England forms. The New England forms and the New England extension, Taylor's "The Glacial Succession in Eastern Michigan" was largely a review of the writer's paper on "The origin of the Glacial Age in the North" was a continuation of an earlier paper by

Two features of the meeting were of special interest. One of the sessions of Section E was devoted to discussion of Niagara Falls, with special reference to the origin of river and related to the reading of the report on the origin of the glacial cover, and the last known. To the session were presented three or four papers and a series of papers based on the same facts, sections, theory, theory, and a whole sample collection of papers on the last two sessions on extended time and on. Then, after the adjournment Friday evening, a day was devoted

by the Association to an excursion to and about the catenets, and the latter evening days were spent by a group of working geologists in detailed mapping and surveys in the vicinity under the leadership of Goode.

The second special feature was a celebration of the sixtieth anniversary of Professor James Hall, a surveyor as Surveyor-General of New York. Vice-President Hancock opened the session devoted to the occasion with an appropriate address on the part of the Association; the General invited for special recognition, on behalf of the Geological Society of America, Mr. Cooper, Secretary General of the Survey, "James H. Hall, Founder of American Stratigraphic Geology," and Professor John M. Clarke read an appreciative memorial address, "Professor Hall and the Survey of the Fourth District." Giovanni A. Favos, President, and others were informally on the program and spoke of Hall's connection with the State, while Hon. J. Taylor Smith, Attorney-General, addressed the meeting in behalf of the State and especially of the Regents of the University of New York. The various geologists formulated a much-needed resolution and resolved to go out together to attend the meeting arranged in his honor, and two days later he was in the field, with his men and equipment, and by exploration the rock geologists in western New York.

DEATH OF G. BROWN GOODE

On September 6, at George Brown Goode, Assistant Secretary of the Smithsonian Institution and Director of the United States National Museum, an active member of the National Geographic Society, an author of an article in the August number of this Magazine, died of heart failure, as reported at Cancer Hospital, Washington, D. C. Dr. Goode was one of the foremost biologists of his generation, his work in ichthyology being especially prominent, and he was the leading scientific worker of the country, if not of the world. When the support of Brown at the oldest end of the globe failed, he was promptly the center of the National Museum. He was credited with much more to the organization and success of the United States Bureau of Commerce, of which he was for a time Superintendent. In addition to his scientific and administrative work, he was a leading member of several patriotic and historical societies and led more or less than any other man of his generation toward accepting the duties of these societies and introducing spirit and life into their work. Although apparently unobtrusive, he was possessed of enormous energy and enthusiasm in his splendid accomplishments in every field that the atmosphere of industry and sacrifice of himself and work which he is known to every noble one who has entered. As a leader and organizer he was perhaps the most brilliant man in the great world of the colony in the National Capital, and in every connection he served just successfully as a mediator between special interests and the public. His untimely death in his forty-sixth year, is a great blow to the nation's interest in our a heavy loss to American science—indeed, in view of his many connections with public interests, it may well be regarded as a national calamity.

W. J. W.



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is every line and corner? There is no portion of the Alps

entire. The Bay of Naples, in all its loveliness, is not a whit

wonderful as Crown Point here as it be a de to know what we can speak. If you desire information about the health and pleasure resorts, its scenery, routes, or ticket rates, apply to any representative of the Southern Pacific for free illustrated pamphlets, maps, and time tables. For additional information call or write to S. E. McLean, C. P. A., Southern Pacific Company, New Orleans, La.



SOUTHERN SYSTEM.

4. The purpose of the study is to determine the effect of the use of the following materials:

DOUBLE DAILY VESTIBULED LIMITED TRAINS

Suppose that \mathcal{C} is a collection of n sets, S_1, S_2, \dots, S_n , and let x be an

Adapted from: Joseph, R. (1994, p. 14)

Winter Resorts of _____, MEXICO and CALIFORNIA.

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1. *Journal of the American Medical Association*, 1997; 278: 1019-1024.

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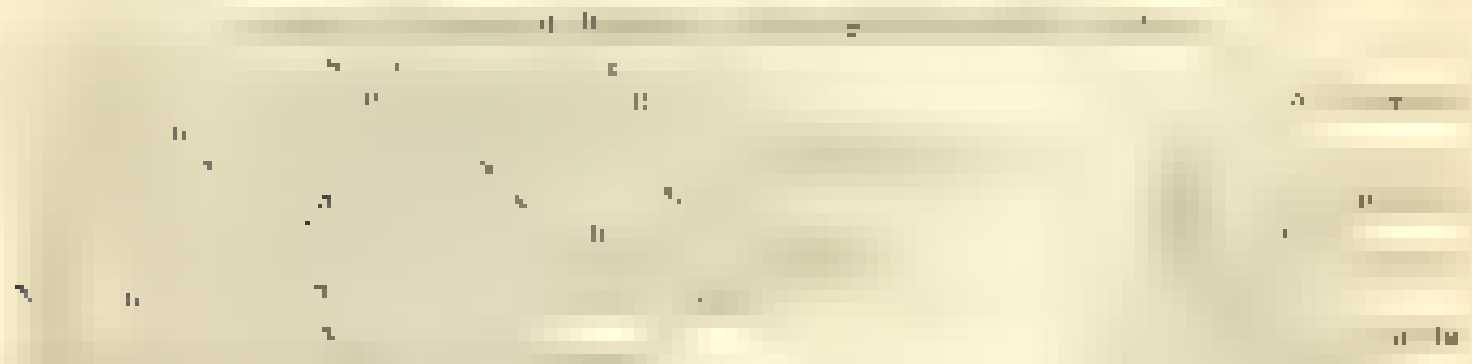
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